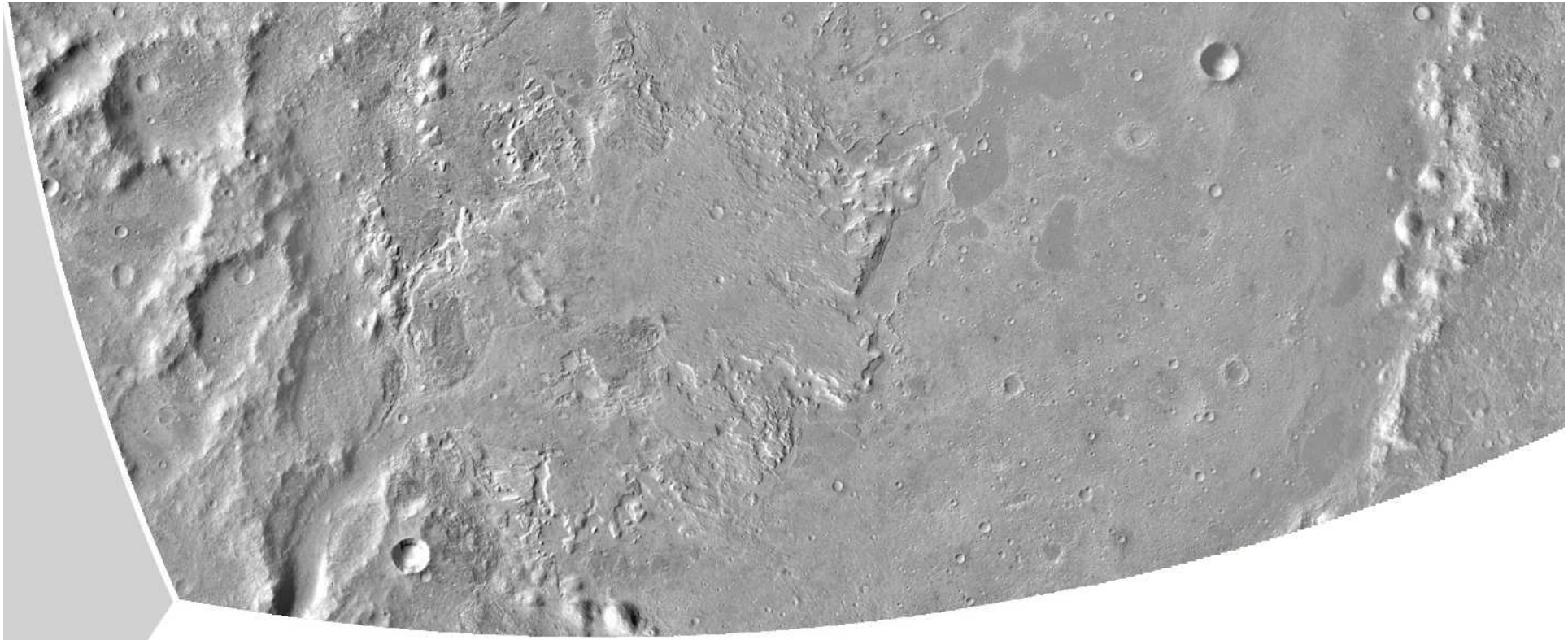


Sedimentary and possible volcanic materials in Xanthe Terra

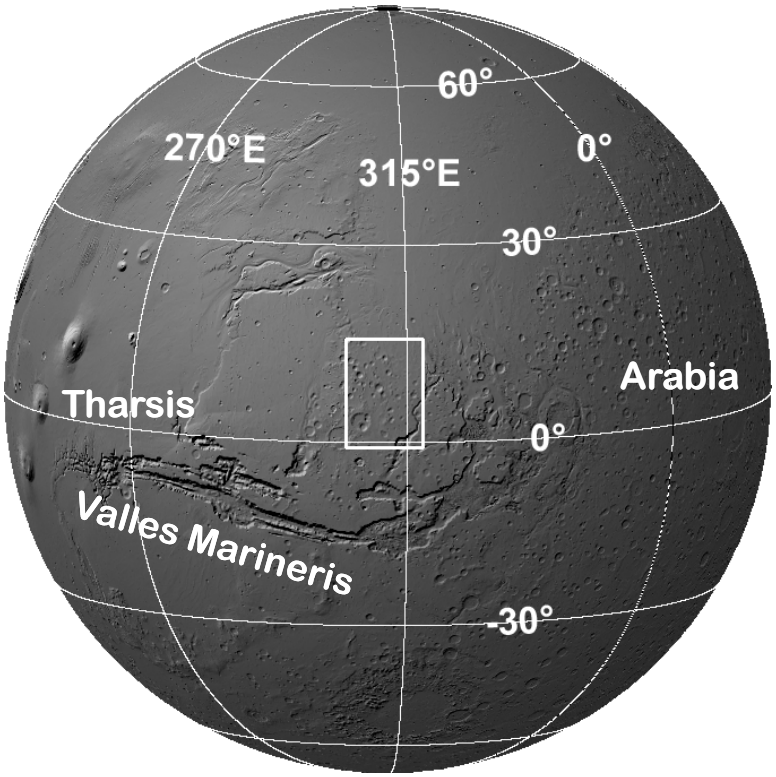
Ernst Hauber, Laetitia Le Deit

DLR-Institute of Planetary Research

Deutsches Zentrum
DLR für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft

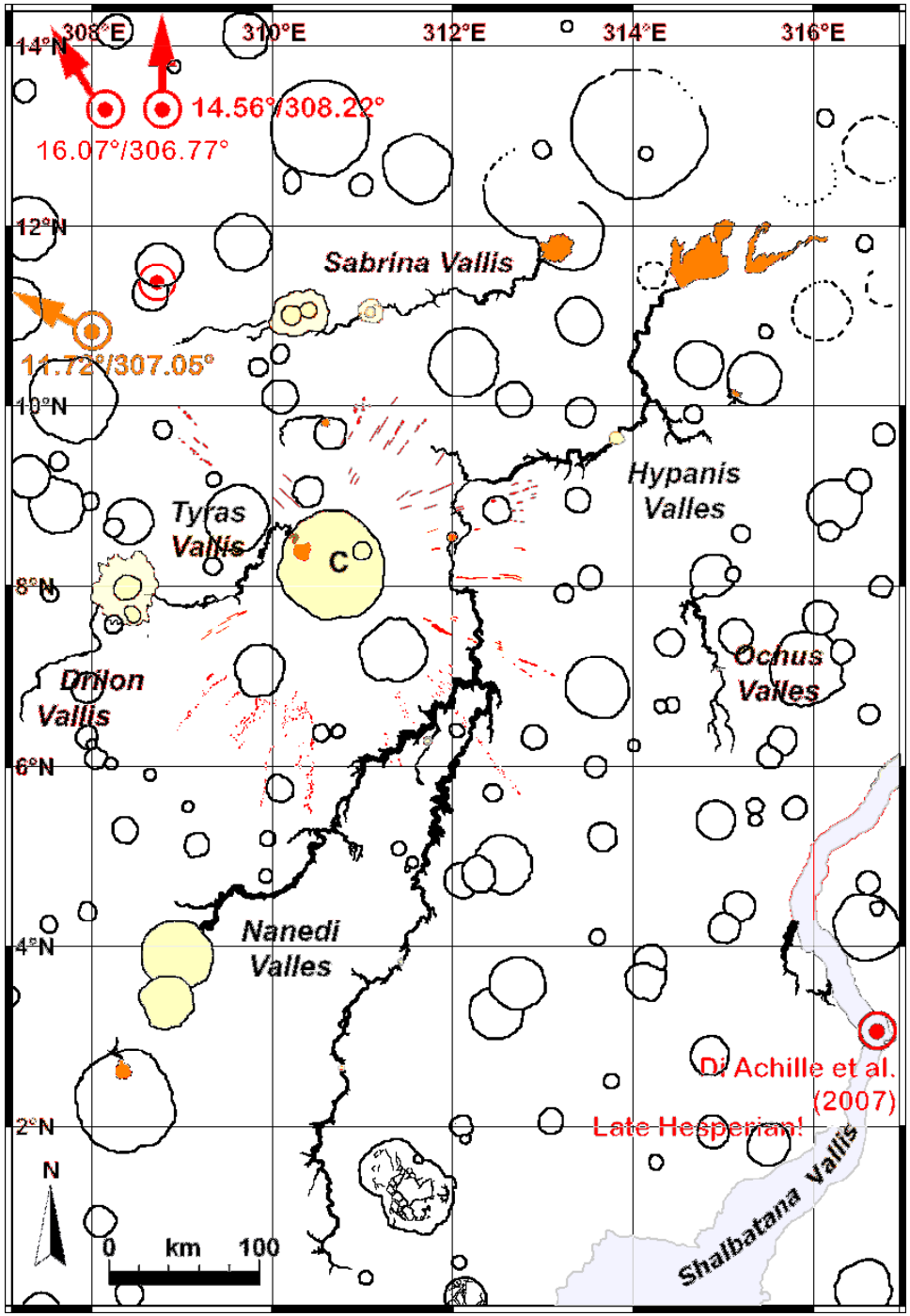
1st (Exo)Mars Landing Site Workshop; 29 February 2012

Regional context

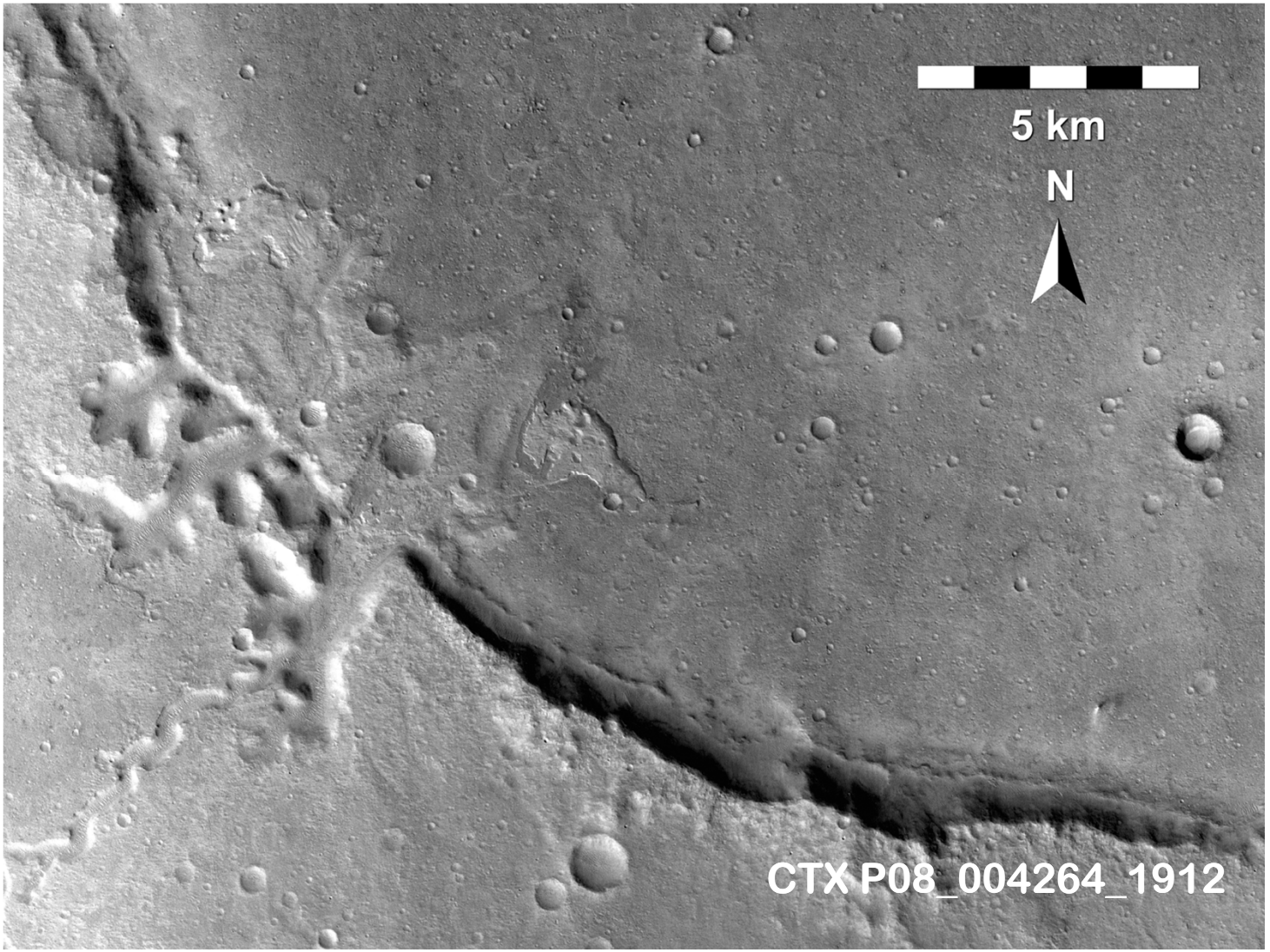


Previous work

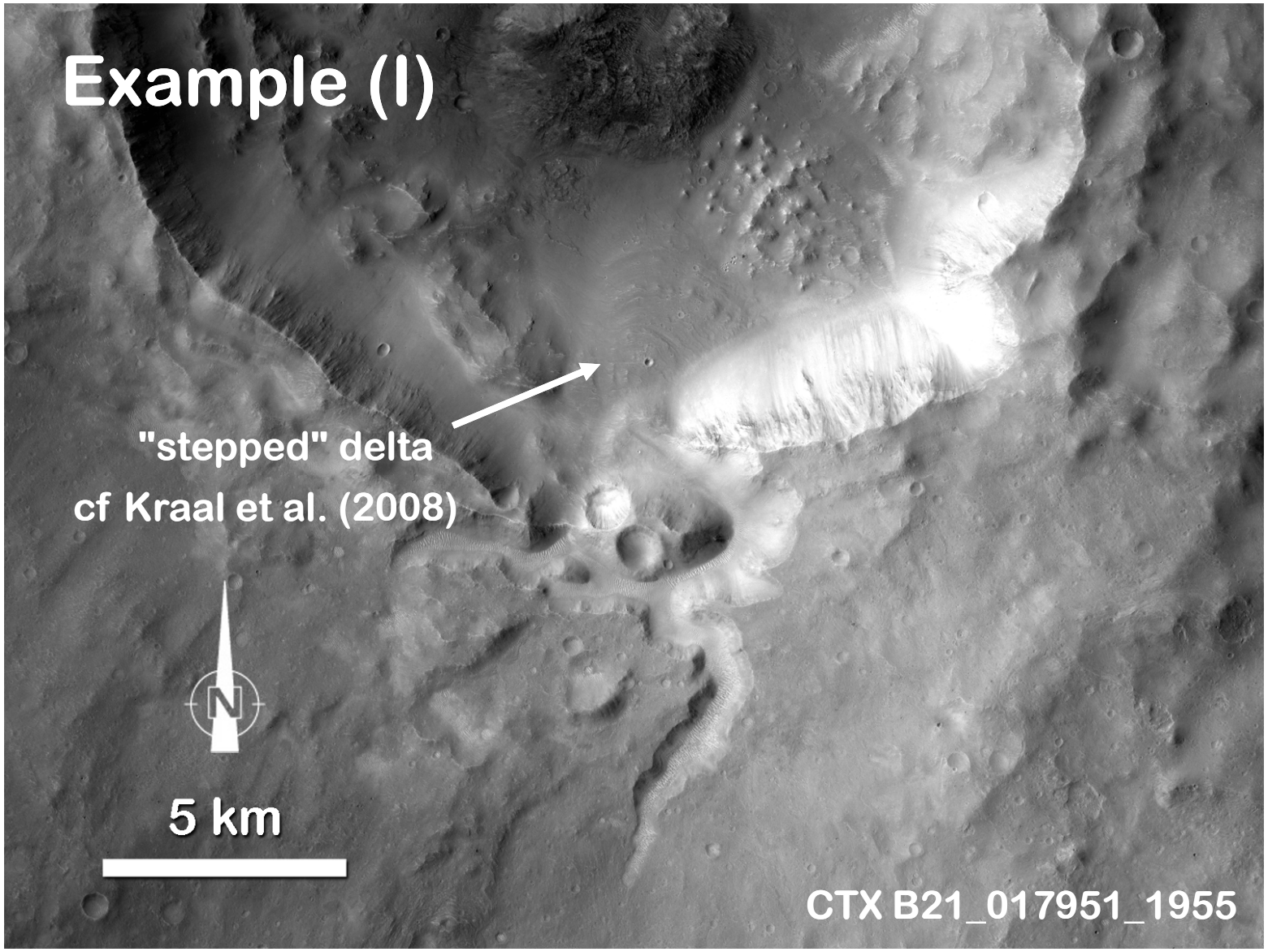
- Old activity (3.8 to 4 Ga)
- Geologically short-term activity
- Hauber et al., PSS (2009)



Examples of fans and deltas (I)

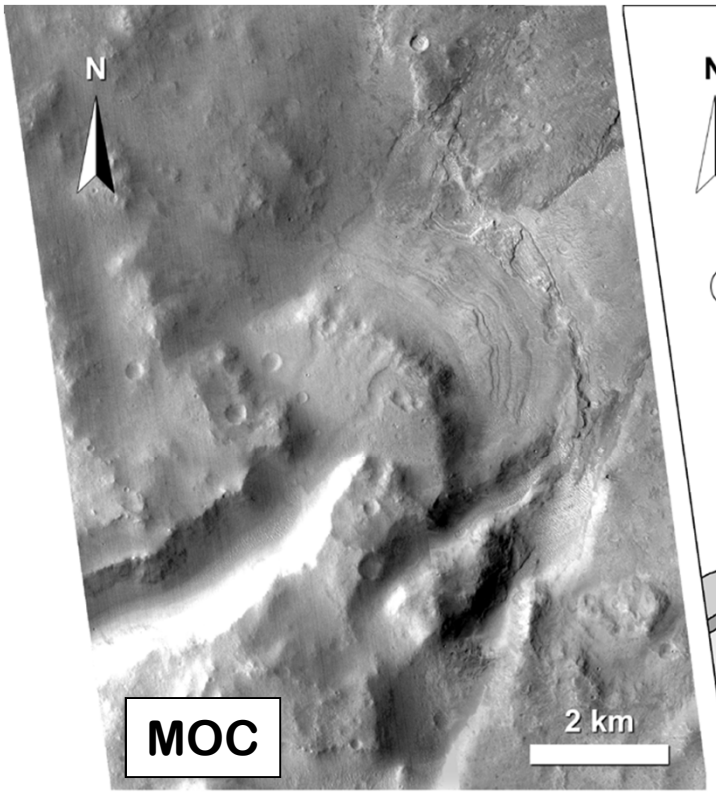


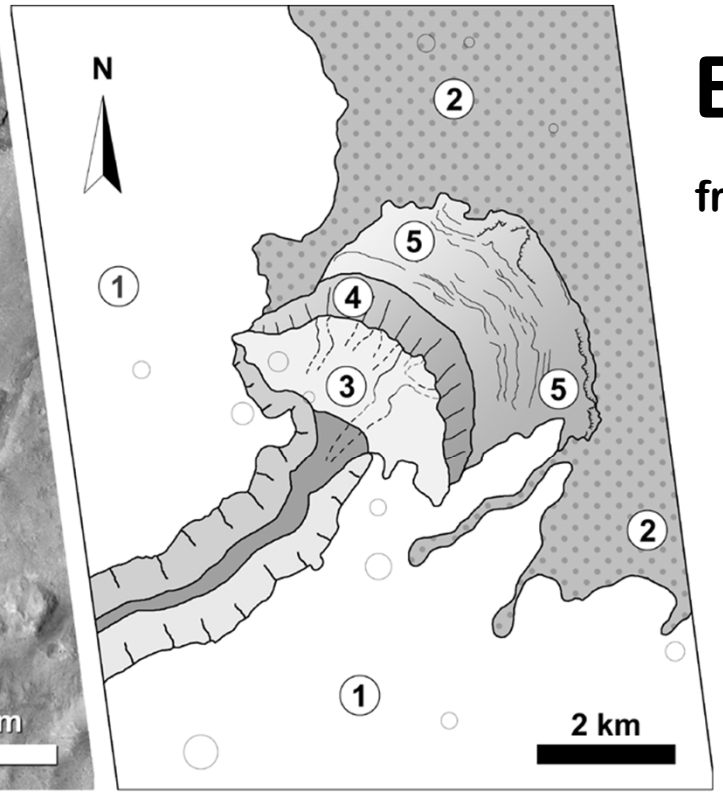
Example (I)

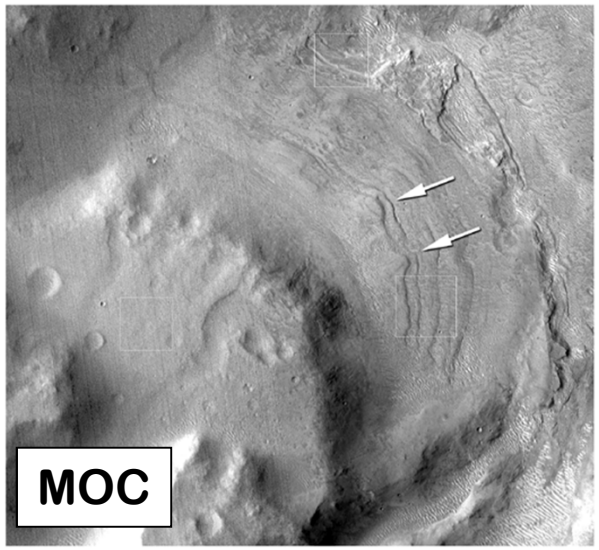


Example (III)

from Hauber et al. (2009)

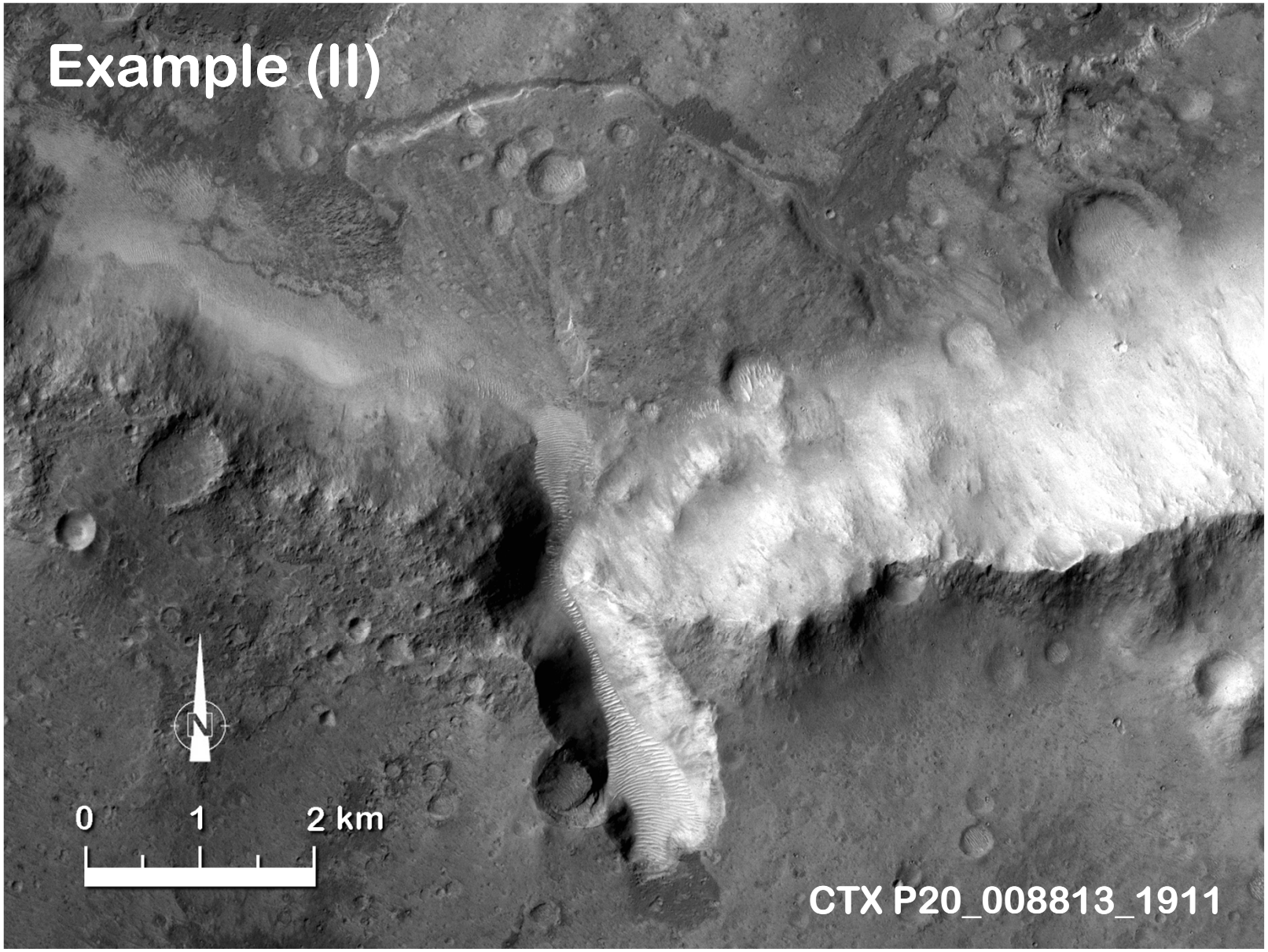


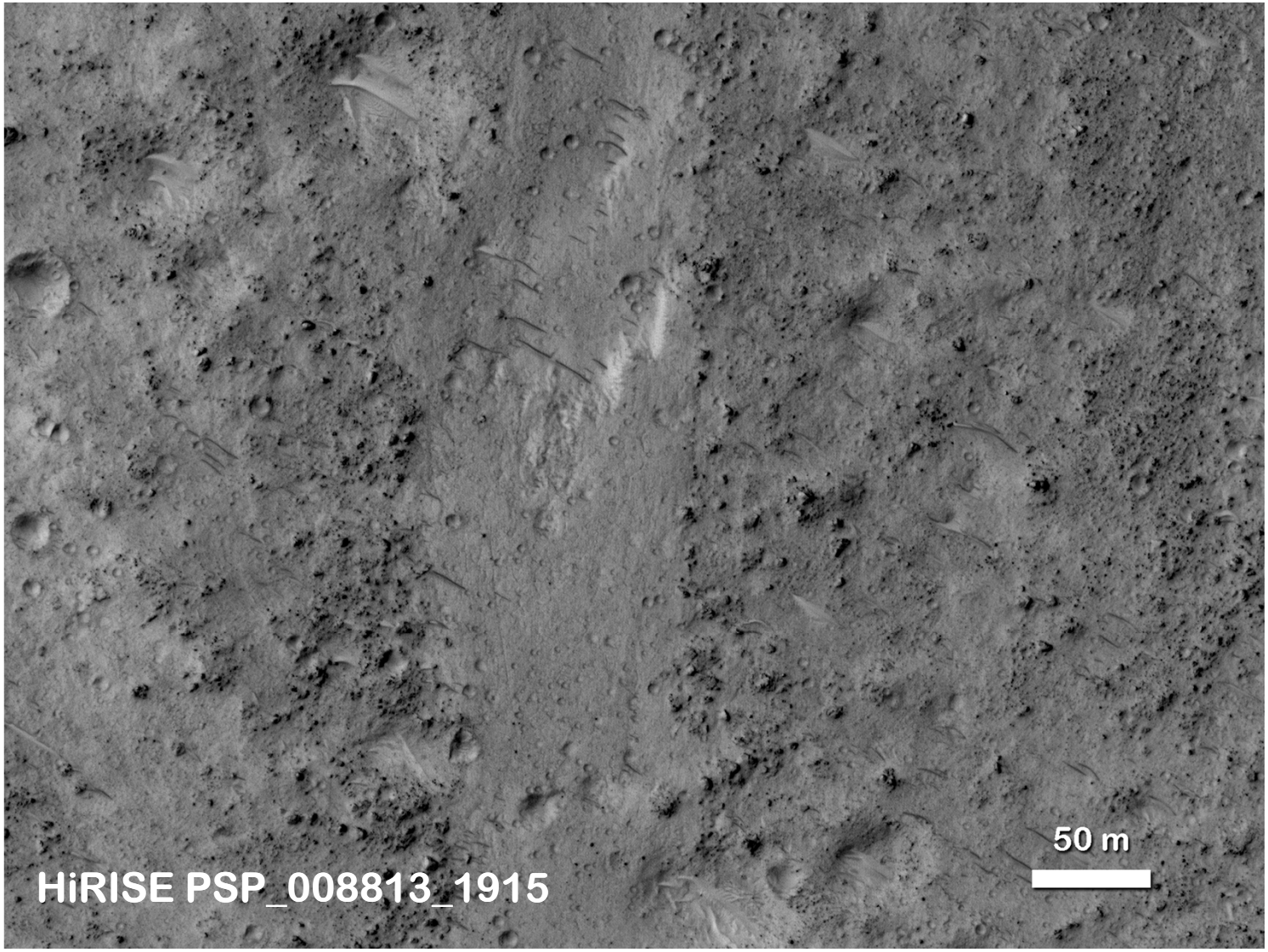


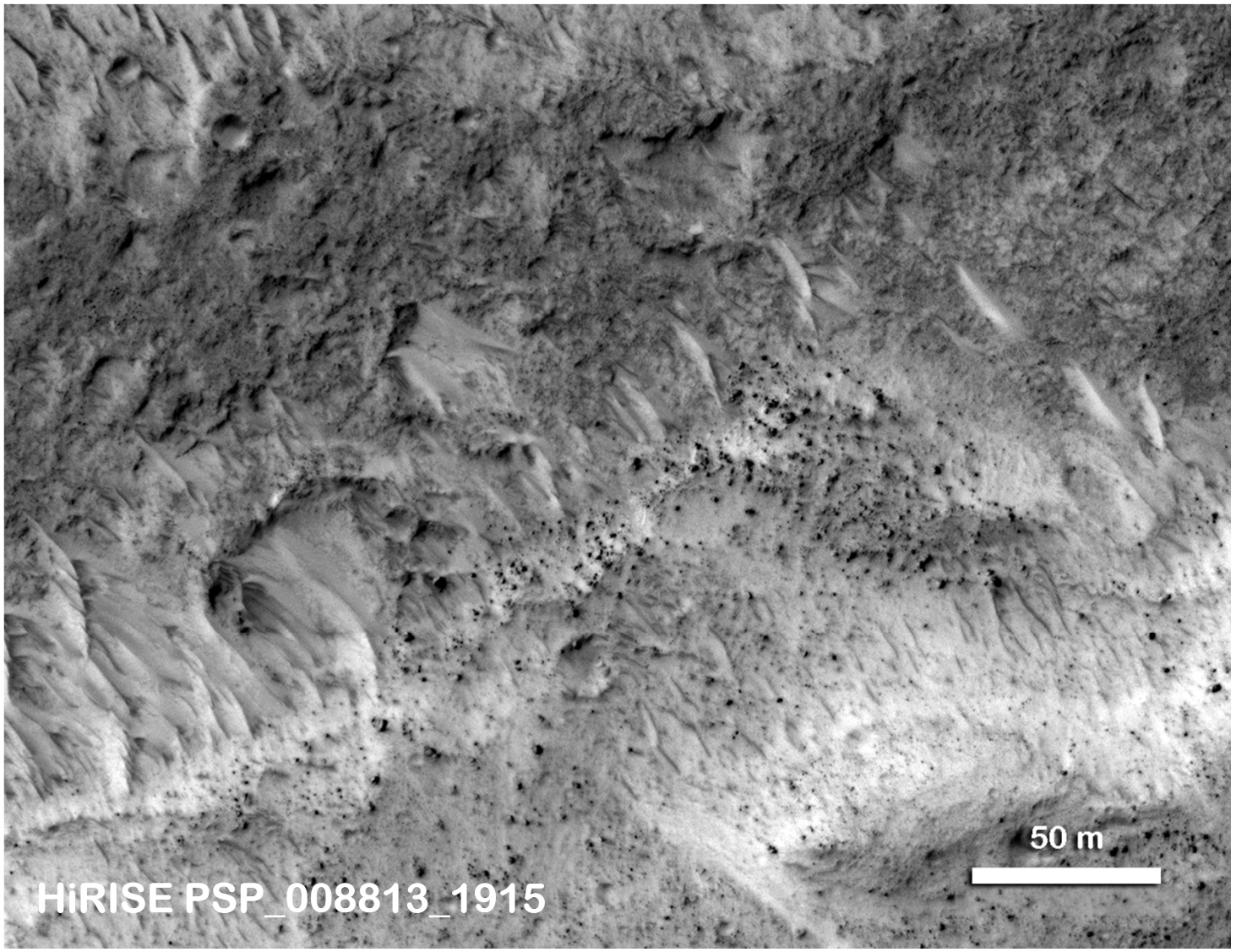


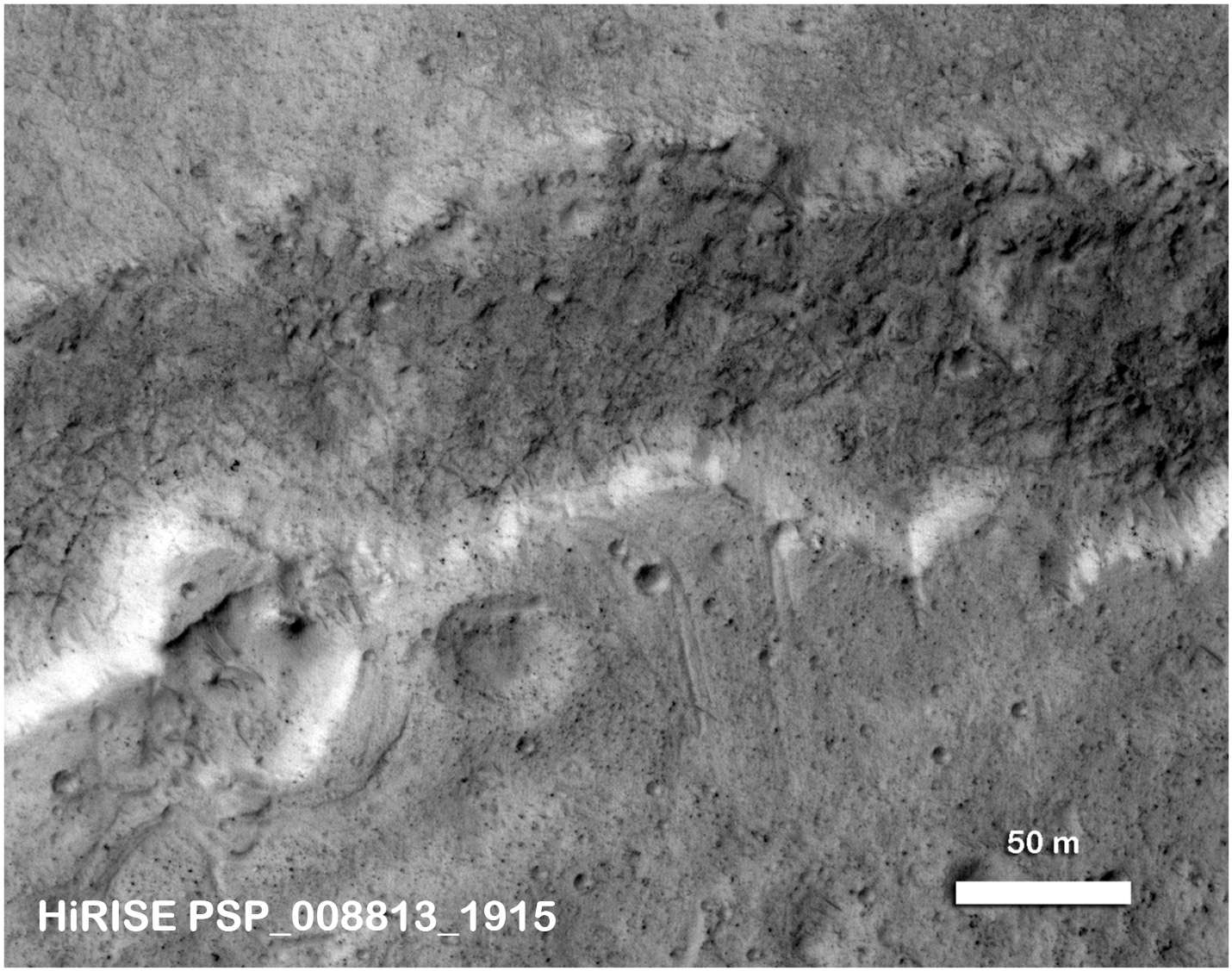
1 Cratered highlands
2 Crater floor
Subur Vallis walls
Subur Vallis floor
3 Upper delta plain (topset)
4 Delta slope (foresets)
5 Lower delta/fan apron (bottomsets)
Impact craters

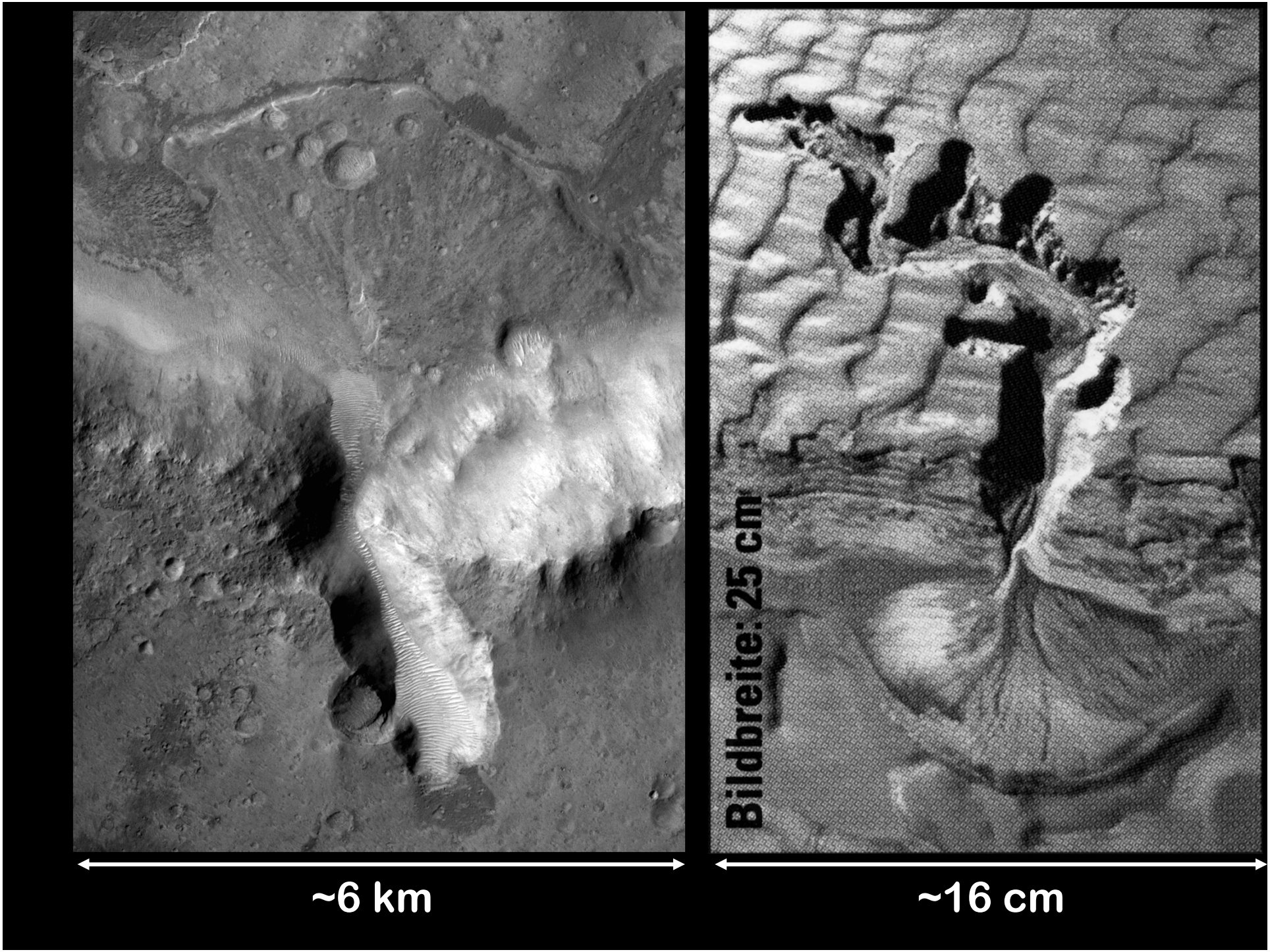
Example (II)




HiRISE PSP_008813_1915
50 m

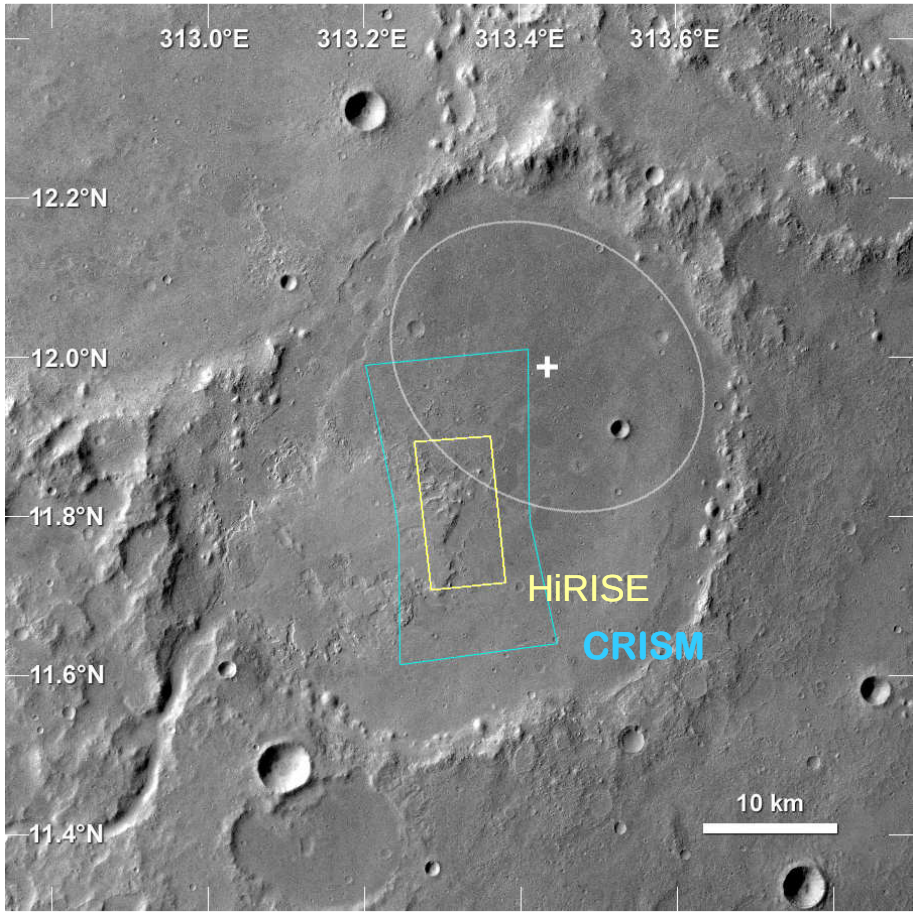

50 m
HiRISE PSP_008813_1915

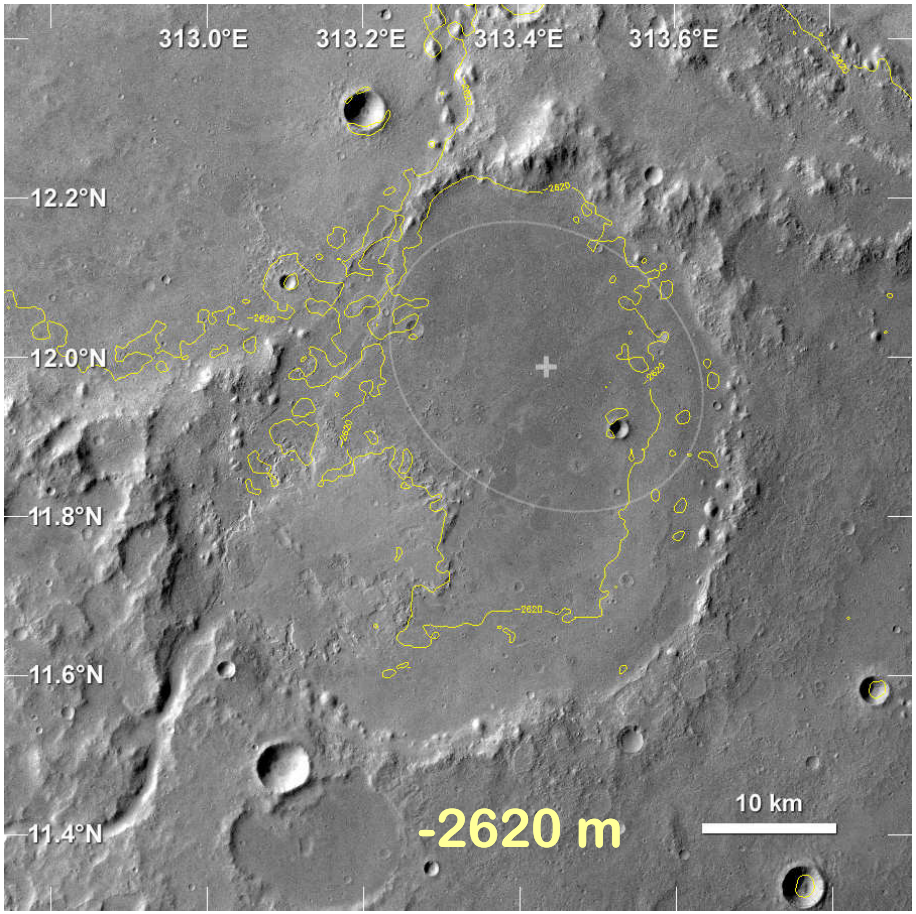

50 m
HiRISE PSP_008813_1915


Bildbreite: 25 cm
~6 km
~16 cm

Proposed landing site

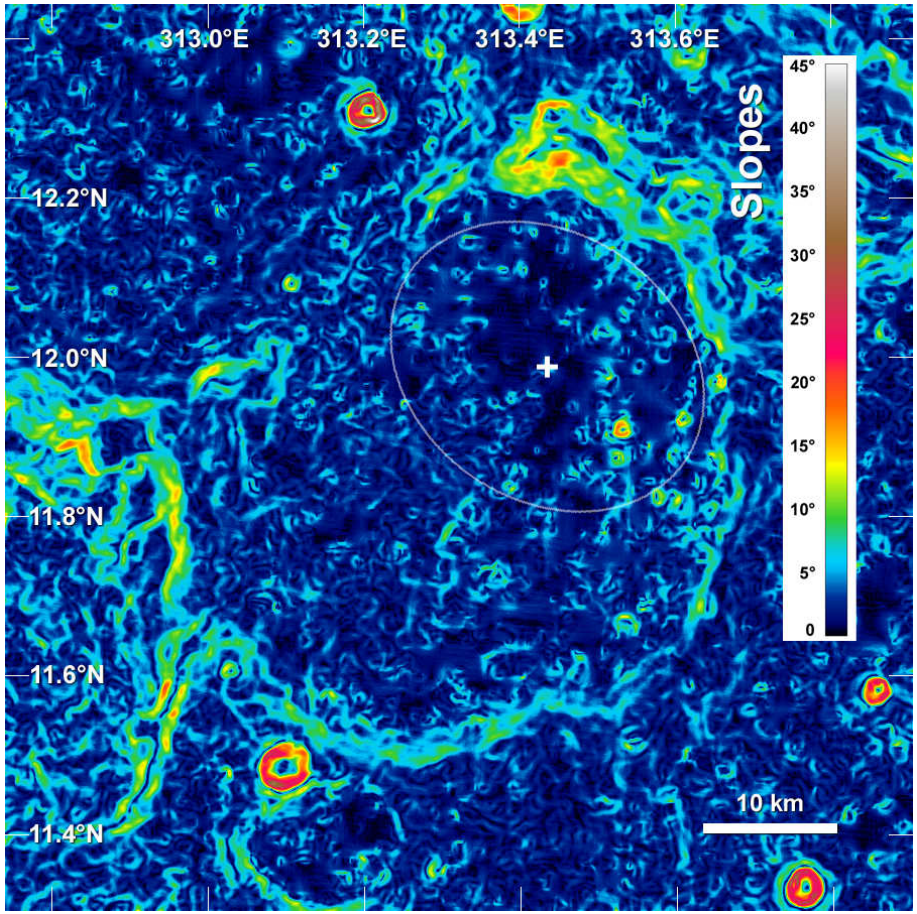
Crater at terminus of Sabrina Vallis

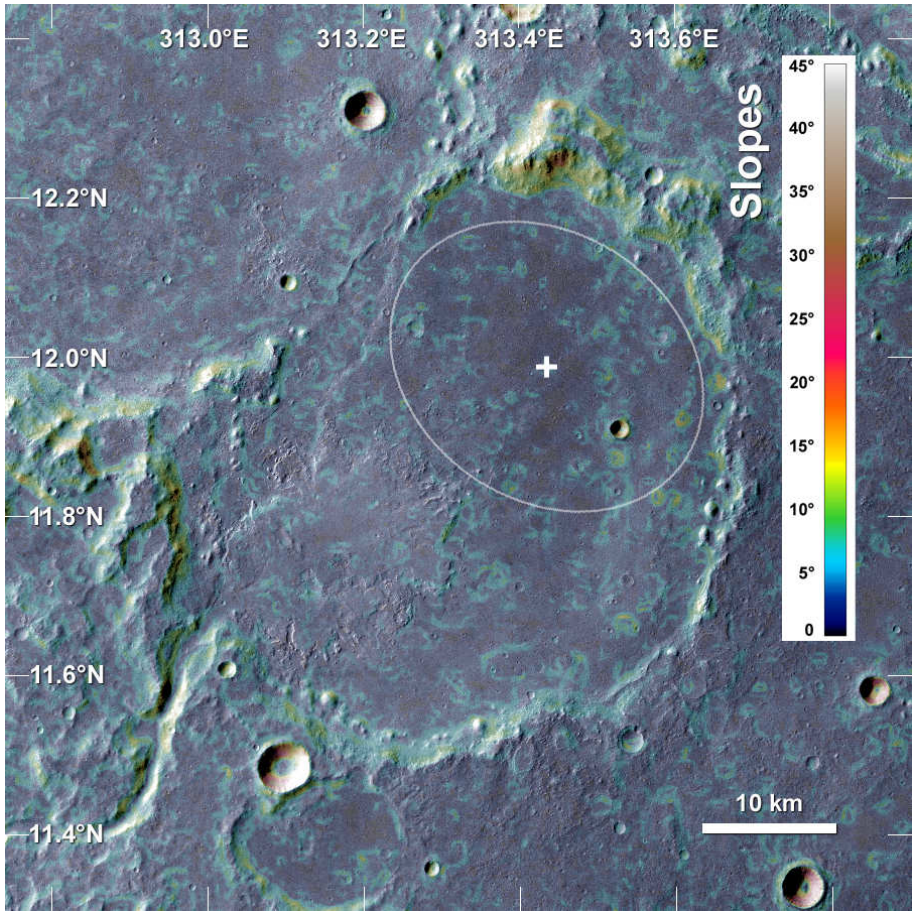




Slopes

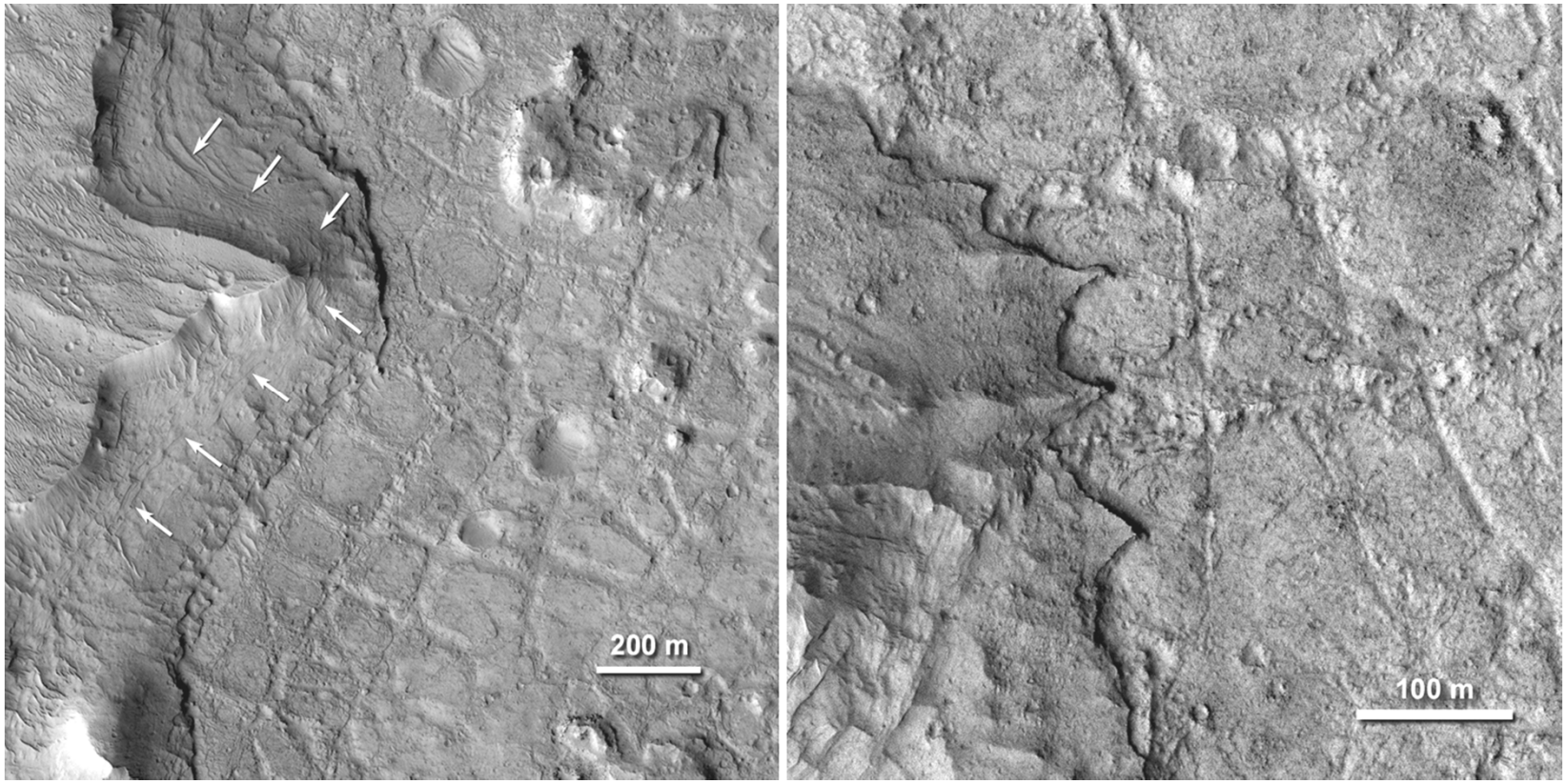
Derived over ~150 m baselength from HRSC DEM



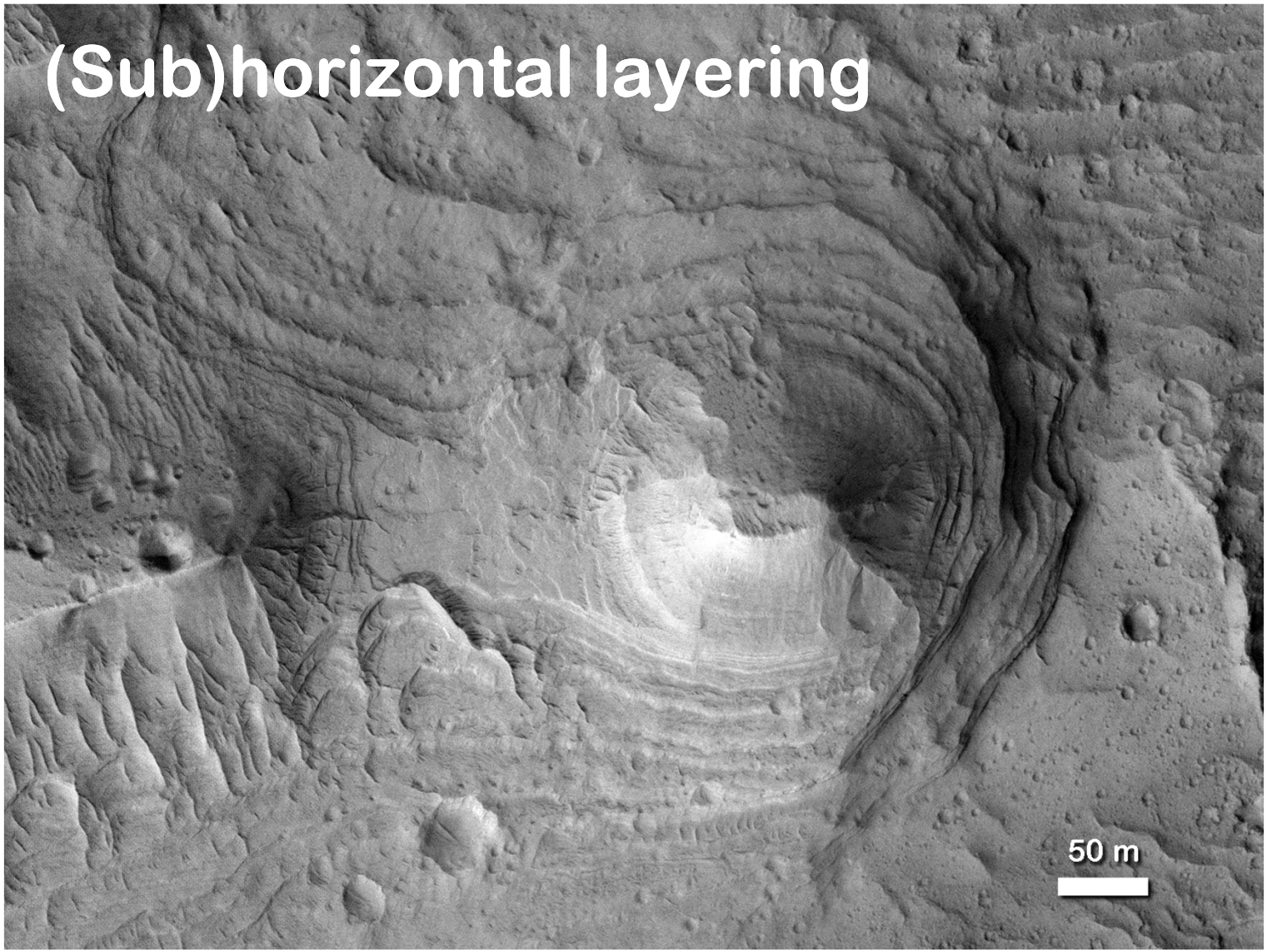


Eroded margins

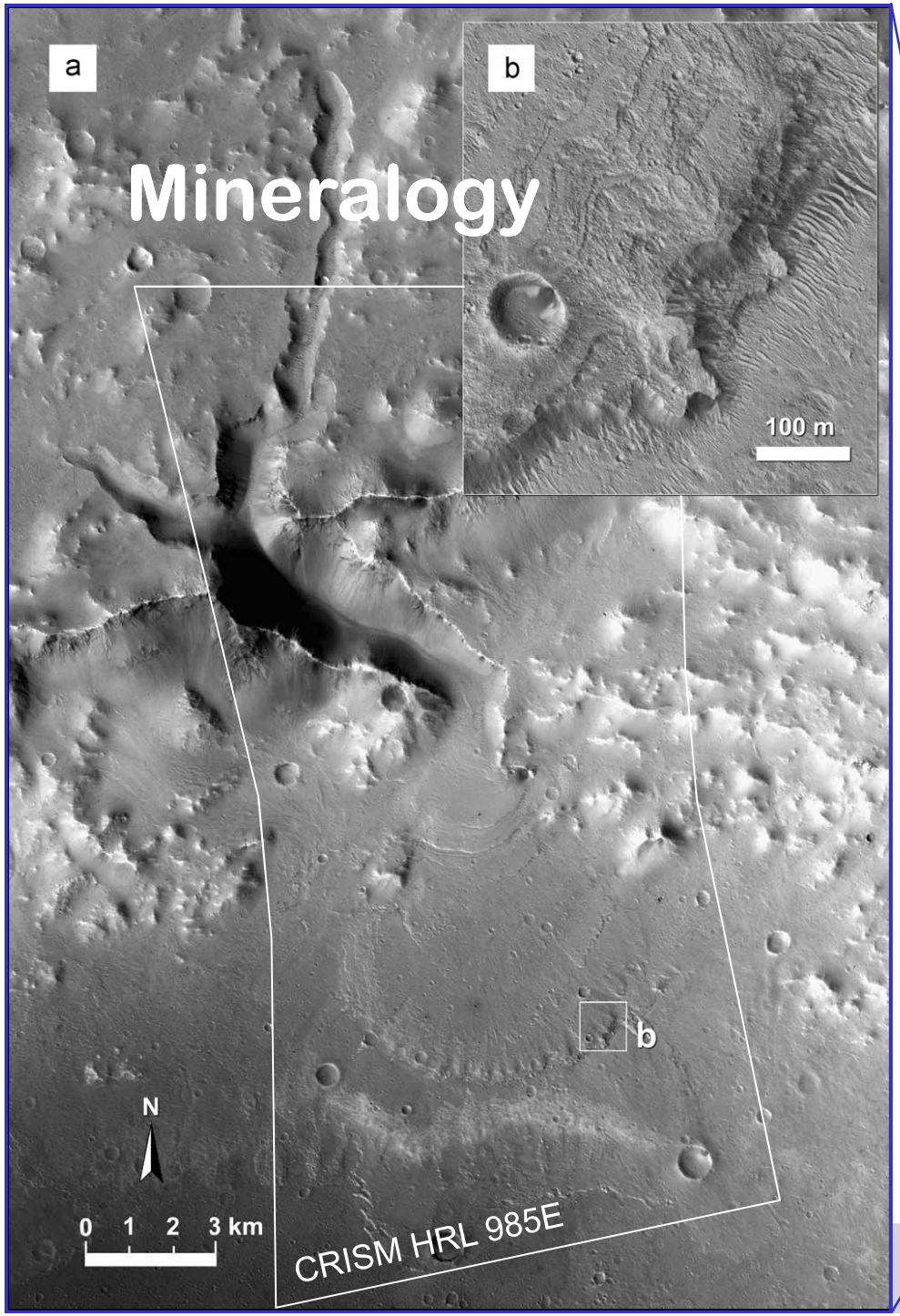
HiRISE

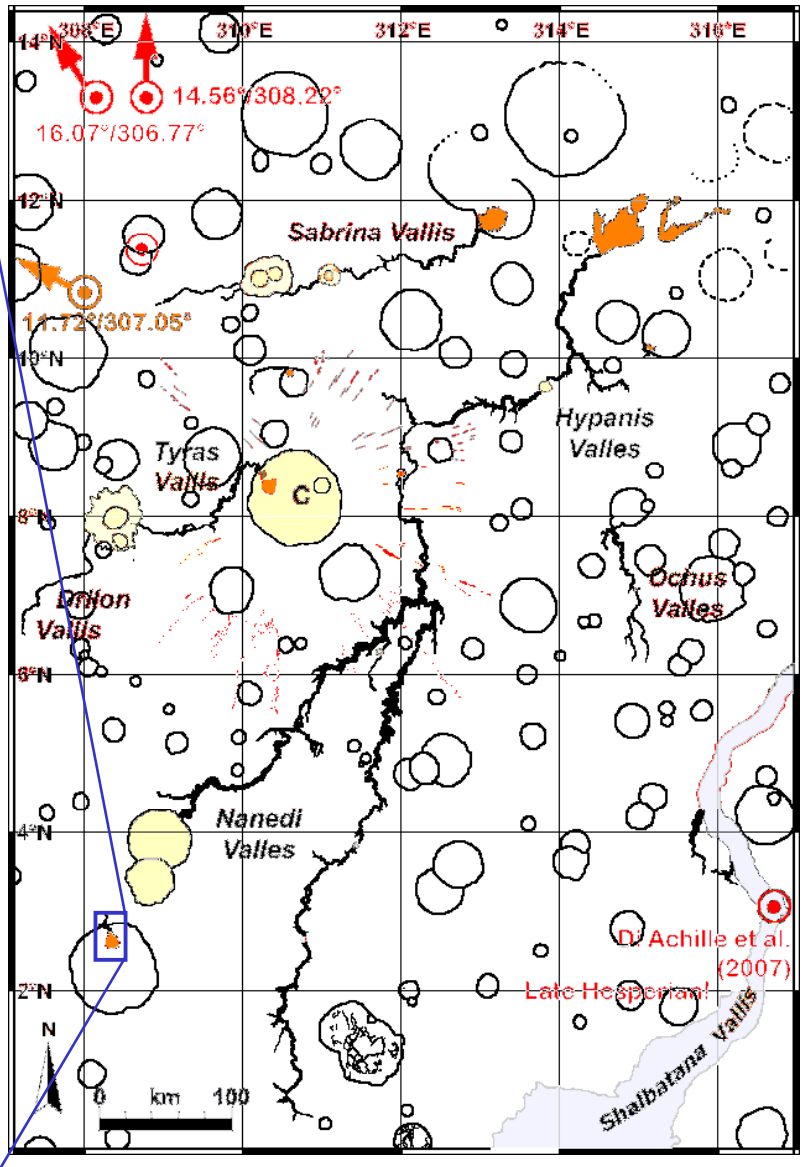


(Sub)horizontal layering

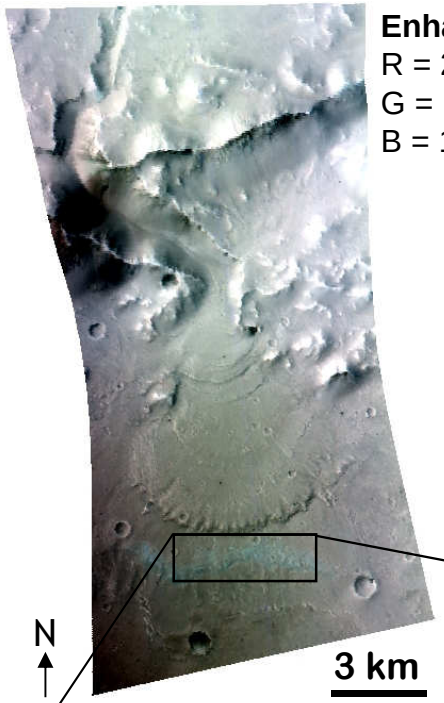


Opal in a nearby fan delta





Opal in a nearby fan delta



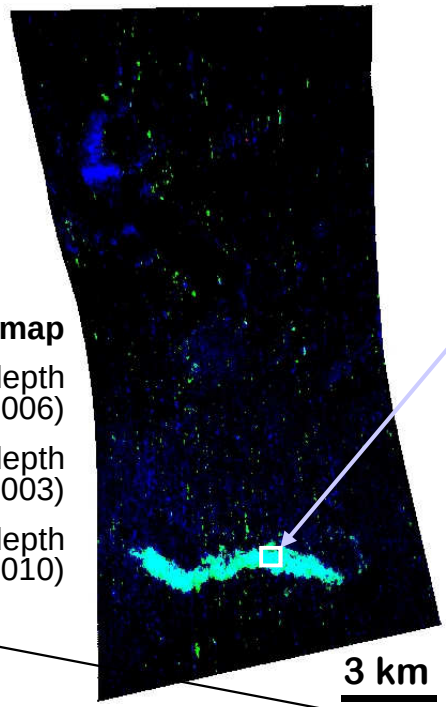
Enhanced IR color
R = 2.5 µm
G = 1.5 µm
B = 1.1 µm

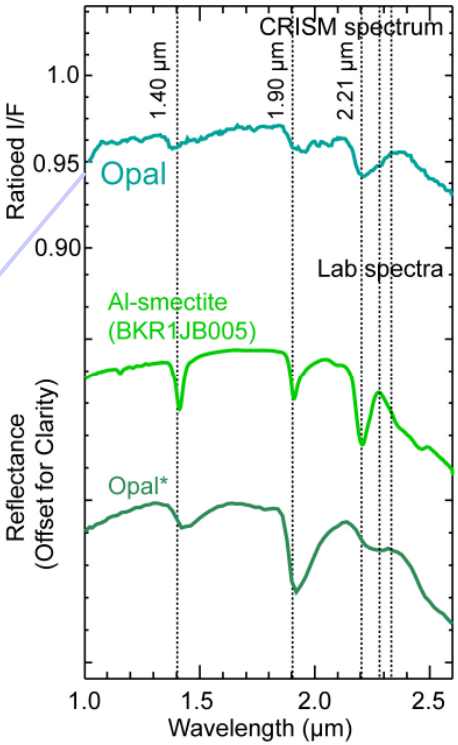
Spectral parameter map

R = 2.3-µm band depth (D2300; 0.001/0.006)

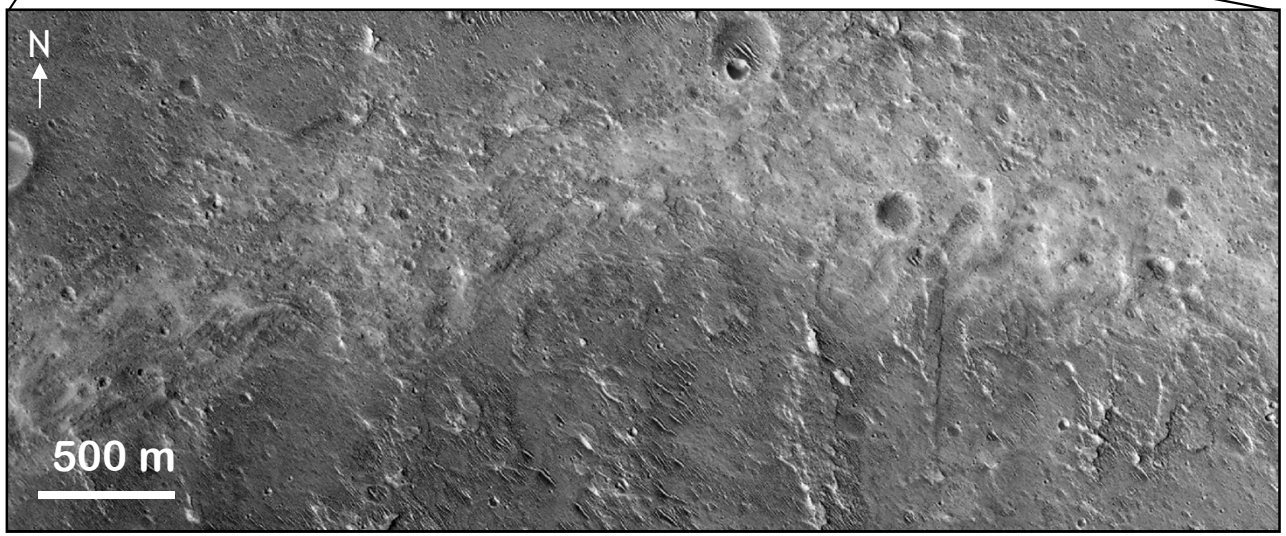
G = 2.2-µm band depth (BD2200; 0.001/0.003)

B = 1.9-µm band depth (BD1900R; 0.005/0.010)





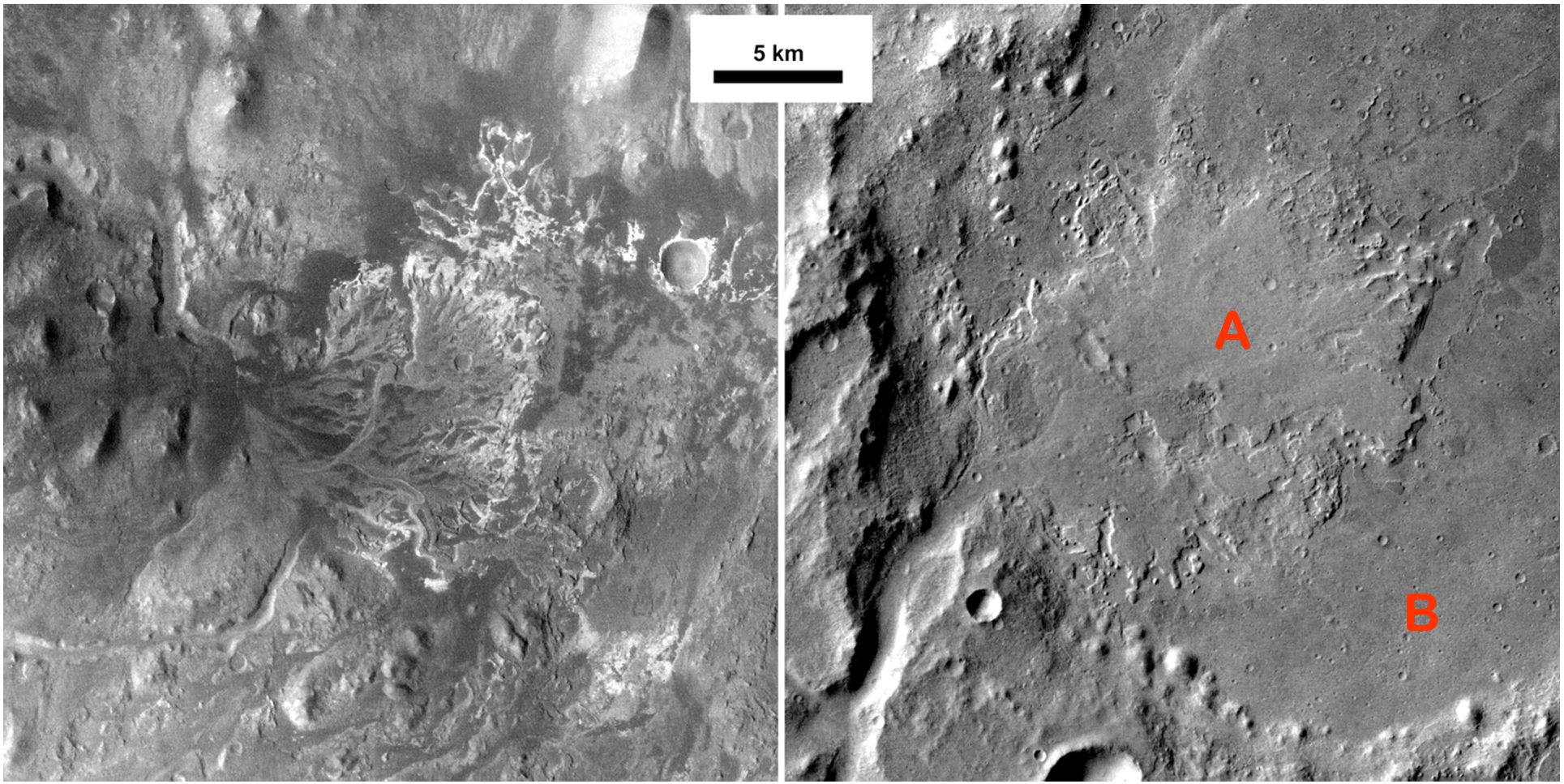
*Spectrum provided by A. Pommerol



HiRISE PSP_006941_1825

- **Opal-rich light-toned material on the distal part of the fan delta**
- **Probably authigenic material (Carter et al., LPSC, 2012)**

Comparison to Eberswalde delta

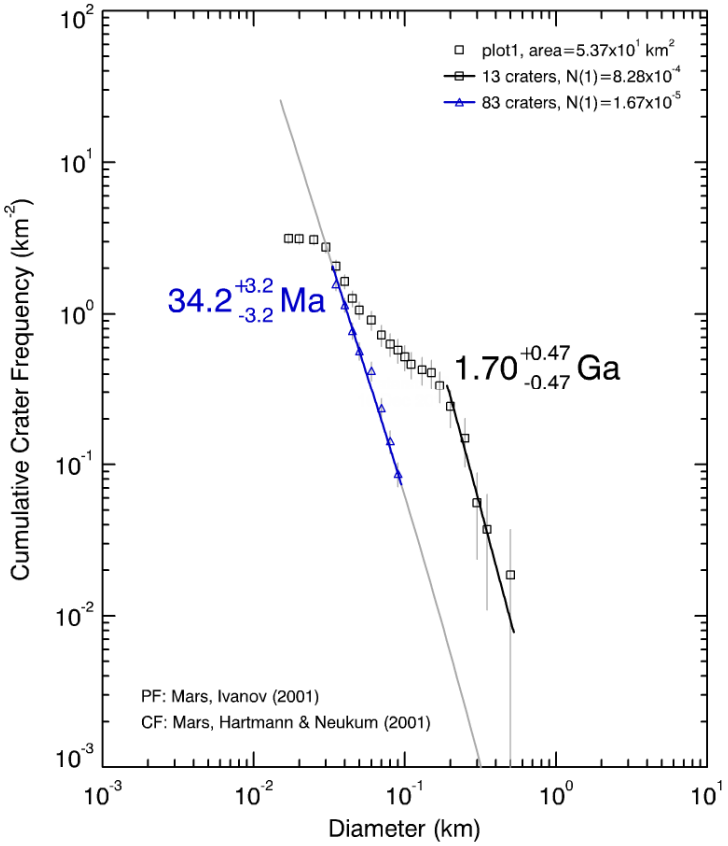


Eberswalde delta is Hesperian-aged (Mangold et al., Icarus, in review)

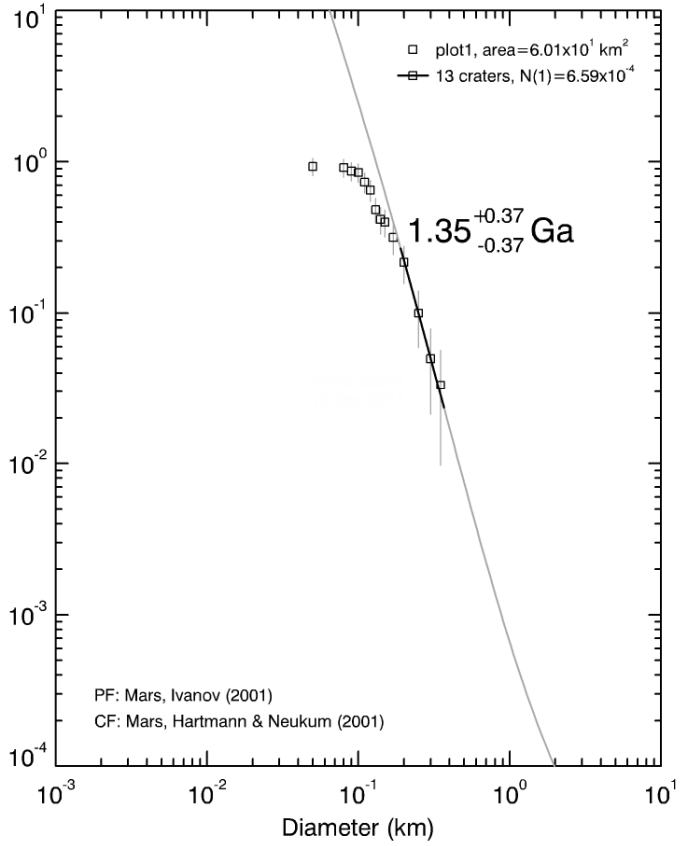
Absolute model ages

Basis for crater counts: CTX images

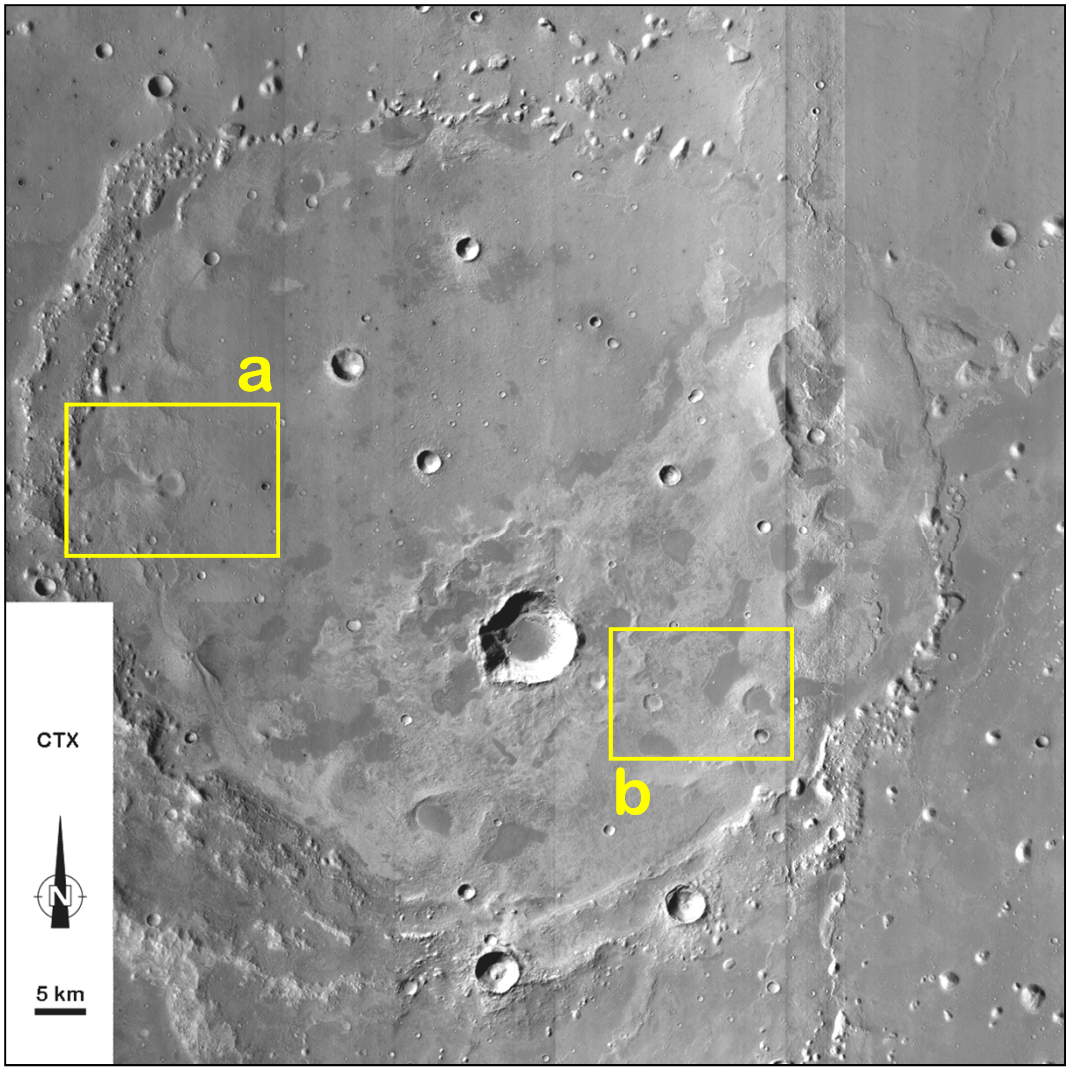
A - Delta surface

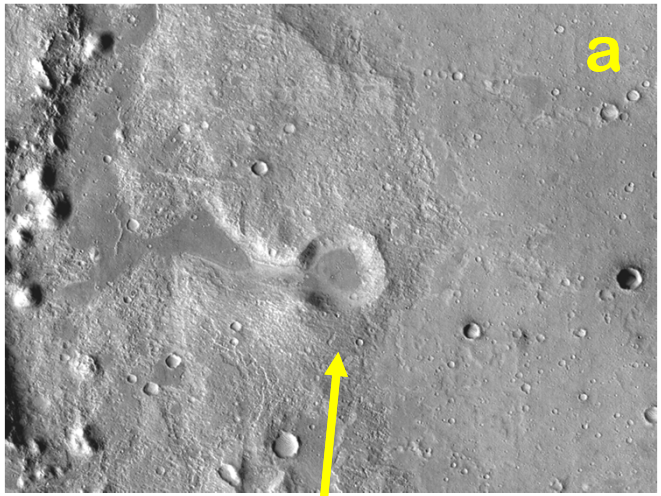


B - Crater floor

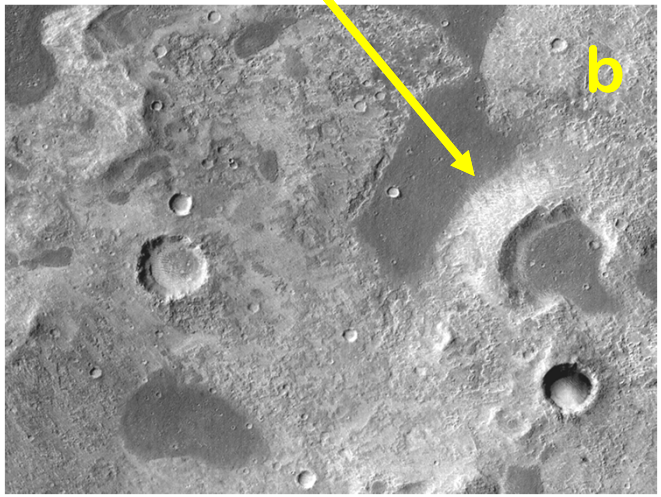


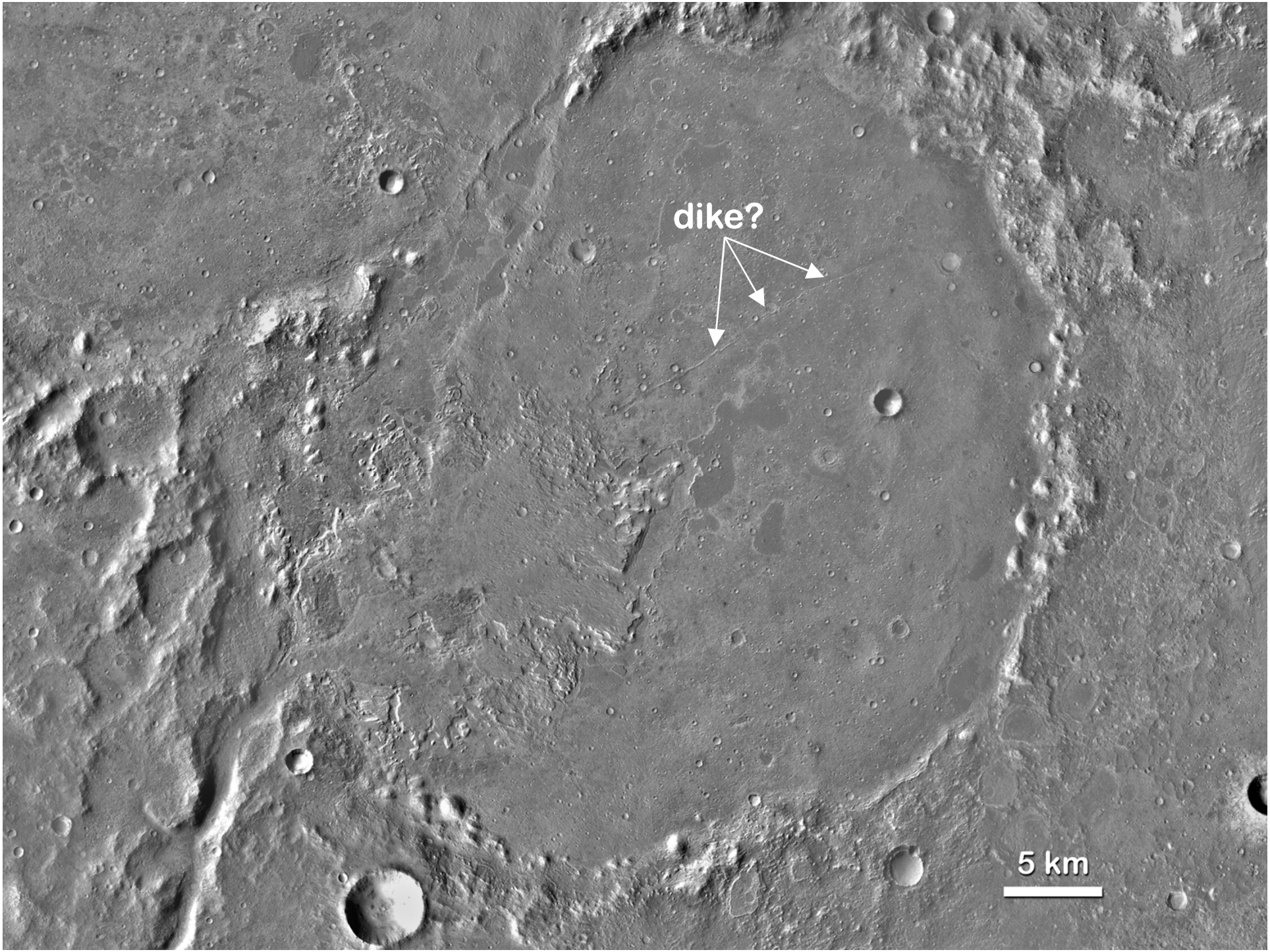
Volcanism in a nearby filled crater (?)

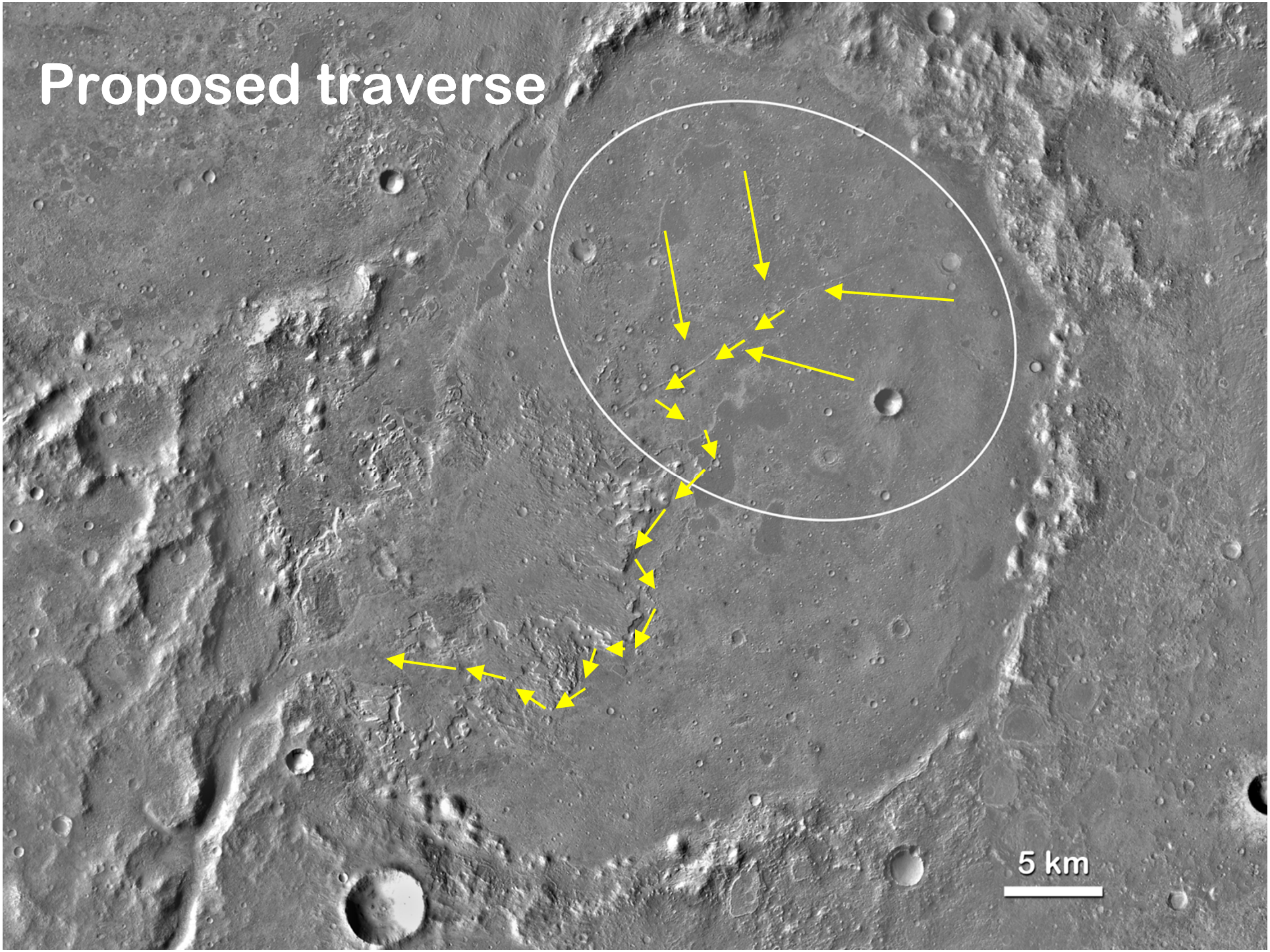




Tuff cones?




dike?
5 km


Proposed traverse
5 km

Summary

Morphology

– variable sedimentary morphology: fans, (stepped) deltas

– deposits in Xanthe Terra indicative of short term activity

Mineralogy

– only one stepped delta with opaline silica

– interpretation: in situ formation

Chronology

– Much younger than Late Noachian/Early Hesperian!

Trigger? Impacts (e.g., Eberswalde)

Climate excursions (obliquity and orbital parameters)

Volcanism

Pros and cons

Pros

- ✓ Sedimentary deposits
- ✓ Volcanic material (E2E iSAG)
- ✓ Safe landing

Cons

- ✗ No mineral detections
- ✗ Young age